Stochastic Queuing Model Analysis to Support Airspace Super Density Operations (ASDO), Phase II

Completed Technology Project (2011 - 2013)

Project Introduction

NASA has been involved in extensive research efforts to develop advanced concepts and technologies, for the Next Generation Air Transportation System (NextGen) under different Research Focus Areas (RFAs). The Airspace Super Density Operations (ASDO) RFA seeks to develop efficient terminal area operations. It is expected that multiple ASDO concepts will be interacting with one another in a complex non-deterministic manner. Therefore, the overall terminal system performance may not be a straightforward combination of individual performance indices. It is also crucial that the overall system performance be robust to wind and operational uncertainties. The proposed research effort seeks to develop a fast-time, stochastic analysis tool based on queuing theory that can be used to evaluate the interaction and combined performance of multiple ASDO concepts. The utility of the approach was demonstrated under Phase I research. Phase II research seeks to achieve the following: (i) make enhancements to the modeling and simulation aspects of the approach, (ii) accelerate the stochastic simulation execution time using high-performance computing solutions, (iii) create software plug-ins for existing NASA research tools, (iv) conduct studies of NextGen terminal area concepts using the queuing simulation, and (v) develop a conflict free scheduling algorithm based on the queuing simulation.

Primary U.S. Work Locations and Key Partners
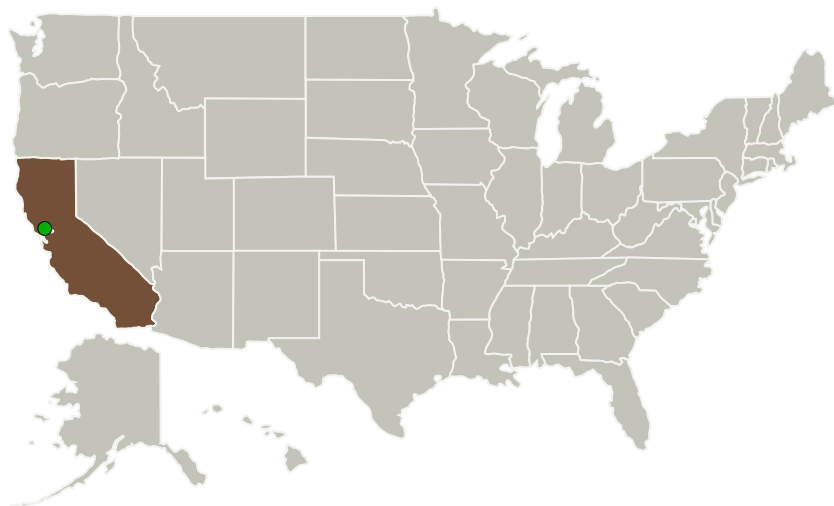
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Table of Contents

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Page 1

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Organizations Performing Work	Role	Type	Location
Optimal Synthesis, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Los Altos, California
⬤Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations
California

Project Transitions

▶ **June 2011:** Project Start

✓ **May 2013:** Closed out

  Closeout Documentation:
  - Final Summary Chart*(https://techport.nasa.gov/file/140548)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Optimal Synthesis, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management
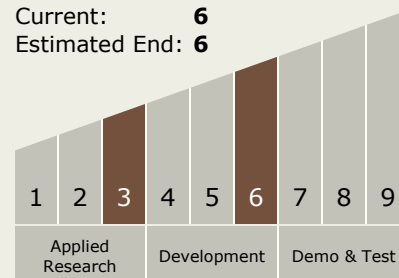
Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Monish D Tandale

Technology Maturity (TRL)

Start: **3**
Current: **6**
Estimated End: **6**

1	2	3	4	5	6	7	8	9
	Applied Research			Development			Demo & Test	

Technology Areas

Primary:

- TX16 Air Traffic Management and Range Tracking Systems
  └ TX16.6 Integrated Modeling, Simulation, and Testing

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System